

We claim:

1. An apparatus for measuring the content of water in an emulsion including hydrocarbons and water, the apparatus comprising:  
a conduit through which the emulsion may flow from a first point to a second point;  
at least one measurement device selected to measure density and capacitance of the emulsion within the conduit to generate a density value and a capacitance value; and  
a computing device capable of receiving the density value and the capacitance value from the at least one measurement device and for the purpose of determining the content of water in the emulsion through the application of a refractive index.
2. An apparatus for measuring the content of water according to claim 1 wherein the emulsion is a mixture of unrefined oil and water.
3. An apparatus for measuring the content of water according to claim 1 wherein the at least one measurement device further is selected to measure temperature of the emulsion within the conduit to generate a temperature value.
4. An apparatus for measuring the content of water in hydrocarbons according to claim 1 wherein the conduit is a pipe for conveying oil at a storage facility.
5. An apparatus for measuring the content of water in hydrocarbons according to claim 4 wherein the pipe extends between a truck and a holding tank whereby the emulsion is off-loaded from the truck into the holding tank.

6. An apparatus for measuring the content of water in hydrocarbons according to claim 1 wherein the at least one measurement device is a capacitance device capable of deriving a capacitance value.
7. A method for measuring the content of water in an emulsion including hydrocarbons and water, the method comprising:
  - providing at least one measurement device for obtaining a density value and a capacitance value from the emulsion;
  - providing a computing device capable of receiving the density value and the capacitance value from the at least one measurement device; and
  - using the density value and the capacitance value to determine: a refractive index value of the emulsion; at least one calibration value; and at least one water content value of the emulsion.
8. The method for measuring the content of water according to claim 7 wherein the emulsion is a mixture of unrefined oil and water.
9. The method for measuring the content of water according to claim 7 wherein the at least one measuring device is useful for obtaining a temperature value from the emulsion and the method further comprises using the temperature value to determine at least one calibration value and at least one water content value of the emulsion.
10. The method for measuring the content of water according to claim 9 wherein the computing device accepts a first set of temperature, density and capacitance values

and a second set of temperature, density and capacitance values, each set of values being derived from two individual measurements from the emulsion by the at least one measurement device and utilizes both sets of values to determine the refractive index value, the at least one calibration value and the at least one water content value.

11. The method for measuring the content of water according to claim 7 wherein the computing device applies an iterative process to its determination of at least one of the at least one calibration value and the at least one water content value of the emulsion.
12. The method for measuring the content of water according to claim 7 wherein the emulsion is being handled at a hydrocarbon storage facility.
13. The method for measuring the content of water according to claim 7 wherein the density value and the capacitance value are obtained from the emulsion as it is being conveyed through a pipe.
14. A method for measuring the content of water in an emulsion including hydrocarbons and water, the method comprising:  
obtaining a density value and a capacitance value from the emulsion;  
and using the density value and the capacitance value to determine: a refractive index value of the emulsion; at least one device calibration value; and at least one water content value of the emulsion.
15. The method for measuring the content of water according to claim 14 wherein the emulsion is a mixture of unrefined oil and water.

16. The method for measuring the content of water according to claim 14, the method further comprising obtaining a temperature value from the emulsion and using the temperature value to determine the at least one calibration value and the at least one water content value of the emulsion.
17. The method for measuring the content of water according to claim 16 wherein the step of obtaining includes obtaining a first set of temperature, density and capacitance values and a second set of temperature, density and capacitance values, each set of values being derived from two individual measurements from the emulsion and wherein both sets of values are used to determine the refractive index value, the at least one calibration value and the at least one water content value.
18. The method for measuring the content of water according to claim 14 wherein the computing device applies an iterative process to its determination of at least one of the at least one calibration value and the at least one water content value of the emulsion.
19. The method for measuring the content of water according to claim 14 wherein the emulsion is being handled at a hydrocarbon storage facility.
20. The method for measuring the content of water according to claim 14 wherein the density value and the capacitance value are obtained from the emulsion as it is being conveyed through a pipe.